Degraded food allergens may retain their sensitising capacity

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Background

What makes an antigen an allergen is not currently known. However, food allergens are assumed to be stable to heat, acid and proteolysis making them resistance to degradation during food preparation and digestion. It is believed that a protein needs to be presented to the immune system in intact form to sensitise an individual and elicit an allergic reaction.

Aim of project

The aim of this project was to examine the sensitising capacity of a digested allergen known to be allergenic.

Perspectives for the dairy

Understanding the properties that make a protein a food allergen has implications for development of hypoallergenic foods.

Break down products from protein ingredients is especially important for manufactures using hydrolysates in hypoallergenic infant formulas.

Cow's milk-based formulas and even extensively hydrolysed milk formulas are known still to provoke allergenic reaction

Currently there are no firm criteria on which to base the manufacture of hypoallergenic formulas.

Methods

Allergen: A purified peanut allergen Ara h 1 was digested in an *in vitro* model designed to mimic the human digestion. The digesta contained to intact Ara h 1. Ara h 1 digesta was composed of peptides of ≤ 2 kDa of which approximately 1/3 had aggregated to larger complexes of M_r 4000-10000.

Animal model: Brown Norway rats were immunised i.p. three times with 1 µg, 50 µg or 200 µg of intact Ara h 1 or 200 µg of digested Ara h 1.

Results

Both intact and digested Ara h 1 were able to induce an immunologic (IgG1, IgG2a) as well as an allergic (IgE) response.

Looking at the immunologic antibody response it is clear that intact Ara h 1 had a higher sensitising capacity than digested Ara h 1. However, it is evident that some epitopes have the ability to survive the digestion process (Fig. 1).

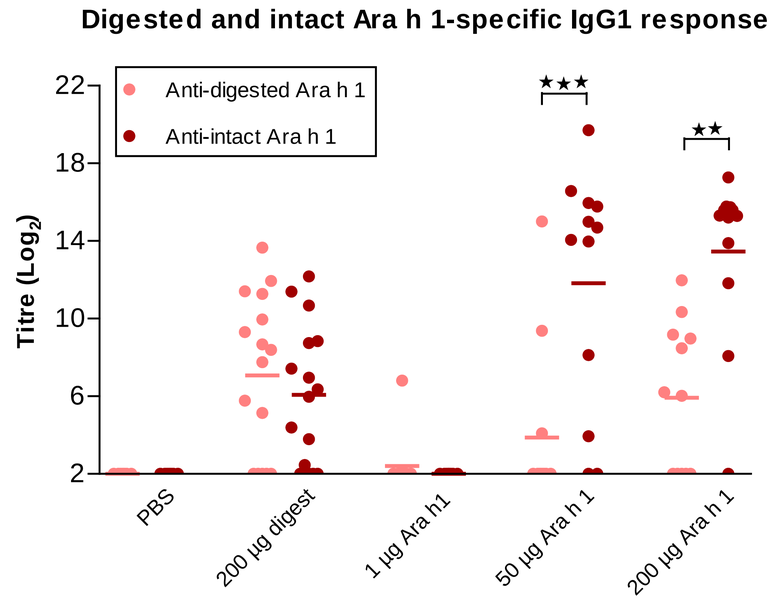

Figure 1: Comparison of intact and digested Ara h 1-specific IgE response

In general rats immunised with intact Ara h 1 reacted more readily with intact than digested Ara h 1. In contrast rats immunised with digested Ara h 1 reacted equally well with digested and intact Ara h 1.

Looking at the allergic response, represented by an RBL-assay, it is seen that both intact and digested Ara h 1 were able to induce an allergic response.

However, sera raised against digested Ara h 1 had a high mediator release when stimulated with both intact and digested Ara h 1 (Fig. 2a), while sera raised against intact Ara h 1 had only a high release when stimulated whit intact Ara h 1 (Fig. 2b).

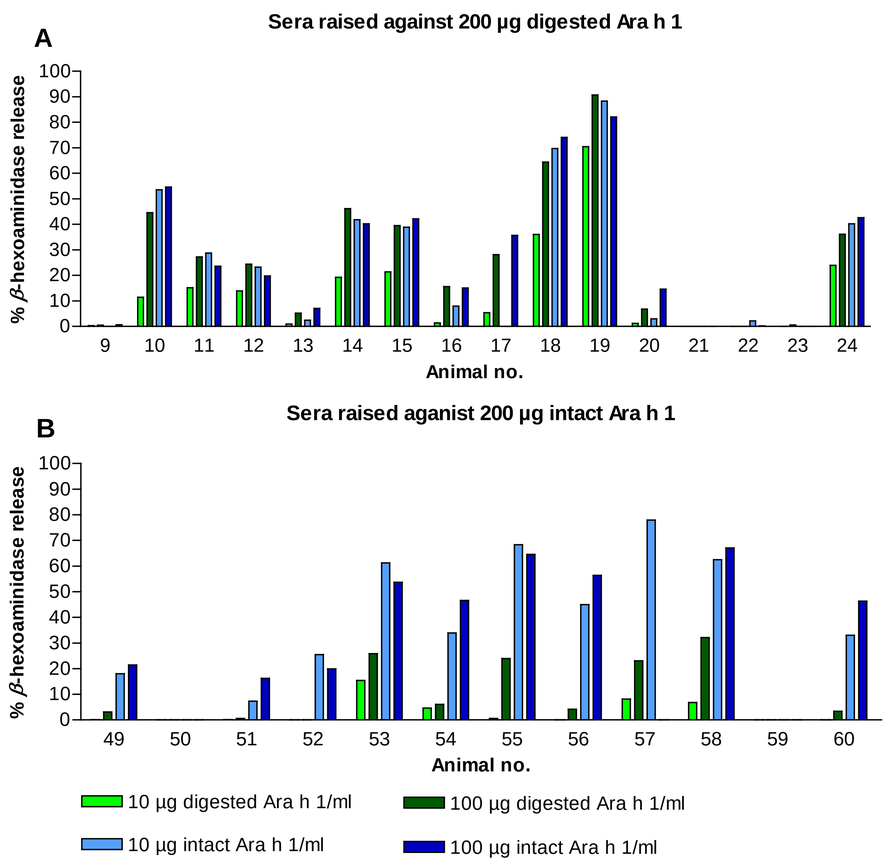

Figure 2: Allergen-specific IgE-mediated mediator release of RBL cells sensitised with sera raised against either digested (A) or intact (B) Ara h 1.

Conclusion

Digestion of an allergen to small peptide fragments does not necessarily lead to elimination of the sensitising potential of that allergen

Could this be a result of these small peptide fragments aggregating to complexes of larger sizes? This is now being investigated in a Ph.D. project supported by Danish Dairy Board.